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12 December 1956

CMCC Doc. No. 151X5.343
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Dear Dick:

We are forwarding herewith eight copies of Monthly Progress Letter No. 5, covering work performed on System No. 4 during the period extending from 1 October 1956 to 1 November 1956.

Sincerely,

Burt

Burt

Enclosures:

CMCC Doc. No. 163X5.20
Copies 1-8 of 13

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Monthly Progress Letter No. 5

Contract No. A-101

System 4

1 October 1956 to 1 November 1956

CMCC Document No. 163X5.20

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System 4, Revised Over-All Block Diagram (appended figure)

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1. General

a. During the period covered by this progress letter:

- (1) The production of prototype subassemblies for the receiving equipments (i-f strips, FM units, AGC units, etc.) was initiated.
- (2) The design of the camera was completed and a model delivered by the vendor.
- (3) The electrical design of the indicator was basically completed.
- (4) Fabrication of the tape transport breadboard was completed and testing initiated.
- (5) The circuit design of the audio and video programming equipment and the power supply was well advanced.

b. An up-to-date revision of the over-all System 4 block diagram is appended to this letter.

2. Antennas and Radome

As indicated in Progress Letter No. 4, all electrical and mechanical antenna designs were completed during the interval covered by this letter and production of prototype models of these antennas is now well underway. In addition, radome tests have been completed and the recommendation made that a fiberglass radome be used. The airframe manufacturer will supply a radome which conforms to the shape of the lower hatch cover of the aircraft.

3. Receiving Equipment

a. Packaging of the front-end components of the channel I receiving equipment has been undertaken. These include the first mixer, first local oscillator, and pre-i-f strips. The design of the channel I subassemblies which are similar to

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the corresponding subassemblies of channels II through VII have been released for fabrication and this effort is now in progress.

b. All subassemblies for the prototype models of the channels II through VII receiving equipment are in process of fabrication. Tuners are being modified by the addition of new gear trains and servo components, and by adapting the frame to accommodate the associated subassemblies.

c. Packaging of the transistorized preamplifier is almost completed. The design of the demodulator units is completed and packaging of these units has started.

4. Camera Indicator

The camera was delivered by the vendor, but the capacity of the film magazine is only 50 feet. However, work on the interim 400-foot magazine has been undertaken. The basic design of the indicator circuits now appears to be acceptable and the packaging effort has been initiated. The camera and indicator will be tested during the coming month.

5. Video Programming

The basic video programming circuit design has been established and an intensive effort to breadboard all units is now in progress. Final circuit design is not likely to be wholly completed until the latter part of this month. Until that time, the formal packaging effort will be kept to a minimum.

6. Audio Programming

a. The bias and erase circuit design for the tape transport has been completed.

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b. The original time multiplex scheme which employed a mechanical commutator for tracks 13 and 14, has been abandoned. The design approach has been changed to conform to the alternatives described in paragraph 6-4 of Progress Letter No. 4. The programming procedure associated with these data is described in the following paragraphs.

c. The AGC data from receiving channels IA through VII are available as d-c voltages. The audio programming equipment will operate to cause each of these AGC voltages to modulate a separate tone carrier. (The frequencies of the carriers will be selected and filtered in such a way that mutual interference is minimized.) The tone carriers will then be summed and applied to track 13 of the tape transport.

d. The data applied to track 14 will consist of a 1000-cycle clock tone, the photo-marker signal, and the composite binary word containing the frequency information, intercept status, and right-left indication from the receiving channels. The 1000-cycle clock tone will be recorded directly on the tape. The photo-marker pulse (about 20 or 30 milliseconds in duration) will be placed on a suitable tone carrier prior to recording.

e. All of the binary data is set into a magnetic-core shift register and the composite binary word is formed by reading out of this shift register. Since eight receivers require frequency indication (eight bits each), and since fourteen channels each require an intercept status indication, and six channels each require a right-left indication (six bits total), a total of 84 bits are required for these purposes. In addition, an extra bit is required to indicate the start of the frame. The shift pulses (which effect the transfer of the data into the registers and onto the tape) will be derived from the 1000-cps clock. In the read-out process, means will be provided to read out the frequency information in straight

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binary form, although it is actually entered into the shift register in the Gray code.

f. A data frame will be completely sampled about every one-tenth of a second. (The frame sampling rate will not be synchronized with the 1000-cps clock frequency.) In addition to the transmission of the binary word, a ready pulse of a few milliseconds duration will be transmitted in advance of every new frame of binary data. This is done to inform the data read-out equipment that a new frame has appeared. The first digit in the frame will always be a "1" to avoid confusion as to the actual start of data. The ready pulse will be transmitted on a different carrier tone. Tentatively, the following carrier tone frequencies have been established: 3500 cps for the binary word; 4645 cps for the ready pulse; and 5230 cps for the photo marker.

7. Tape Transport

Fabrication of the basic tape transport was completed during the interval covered by this letter and testing will be undertaken shortly.

8. Power Supply

The power supply design has been established and construction and purchase of component parts is in progress. (A large part of the basic power supply design will use commercially available units.)

9. Preflight Test Set

The basic requirements and design of a preflight test set for System 4 are now established. These will be described in a technical exhibit which will be submitted during the last week of November 1956.

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10. Planning

During the next reporting interval, the major effort will be directed toward completing the fabrication of all System 4 equipments essential to the system flight tests scheduled for 1 December 1956. Particular emphasis will be placed on completing the fabrication of the channel I receiving equipment and the video programming equipment since present schedules indicate that these equipments may not be completed by the present flight-test date.

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